Modular Reconfigurable C4I Interface (MRCI) and the Army

Operational and Technical Requirements

Presented to DMSO on Behalf of the Army Team

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Purpose

- Identify Army requirements for a reconfigurable interface between simulations and C4I systems.
- Propose Army C4I Systems and Simulations for experiments.
- Offer support, facilities, and hard work to execute experiments.

Agenda

- **Goals**
- **Army Team**
- **Operational Concepts and Requirements**
- **Technical Concepts and Requirements**
- **Proposal**
  - C4I System and Simulation Nominations
  - Synchronization
- **Summary**

Army Goals

- Orient design on the future (WARSIM 2000/CATT/BLRSI & DII/ COE C4I systems) while leveraging near term opportunities.
- Leverage significant experience in C4I stimulation in testing, training, and experimentation community
- Use MRCI program to energize Army internal Sim-to-C4I working relationship IAW with ABCS MOU and the C4I Stimulation Working Group (TRADOC, AMC STRICOM, OPTEC, PEO C3)
- Be a team player throughout the design and integration process.

The Army Team

- Team members represent major Army organizations involved in the development of simulations and C4I systems.
- Supplemented by experts from the testing field with recent developmental experience.
- The Team is growing.
- NSC has lead for overall coordination.

DA: AMSO and DISC4				
SIM Cbt Developer	**SIM PM**	**C^4I Cbt Developer**	**C^4I Pms**	**R&D**
Nat Sim Ctr Mr. Joe Henry Battle Labs Ms. Dianne Scheutze	PM CATT COL Shiflett PM DIS COL Etchechury	TPIO-ABCS COL Robert Lossius	PEO C3 Mr. Ben Hart	CECOM Mr. Kurt Kovach
TEXCOM: Mr John Diem		Electronic Proving Ground: Ms. Tami Johnson		

Army Operational Concepts*

- Training (Exercises and Embedded Training).
- Military Operations.
  - Tactical, Strategic, and Operational: METT-T Specific.
  - Planning/Decision Support, Mission Rehearsal, Execution.
- Warfighting Experiments/Analysis.
- Testing/Stimulation of C4I Systems.

Army Requirements Cover the Domains of Simulation and Military Operations

* *Expanded in the back up slides.*

Operational Requirements

- Transparent to User:
  - Covers all data and messages.
  - Uses organic communications: Radio (voice, data), Wire/Fiber.
  - Operates in real time or perceptible real time.
  - Operates with dynamic changes in task organization/networks.
  - Non-intrusive to C4I systems during setup and use.
  - Operates during and recovers from system failures.
- Operates at different security levels, multi-level eventually.
- Supports Platform to BN to Echelons Above Corps:
  - Supports platform sim.
  - Supports Unit/Aggregate sim.
- A “Go to War” capability.
- Shortens the 4 Poles in the C4I-Simulation tent:
  - Establishing Scenario & C4I laydown.
  - Populating & Synchronizing Databases.
  - Establishing Physical Linkages.
  - Supporting an AAR.

Technical Concepts

- What is an MRCI?
  - A Message Center and Traffic Cop:
    - ≈ Translates messages and data.
    - ≈ Adjudicates delivery.
    - ≈ Ensures Delivery - Closed Loop Interactions.
  - The Chief Integrator and Differentiator:
    - ≈ Ensures all info is gathered for a given message.
    - ≈ Ensures info in a given message goes to all the right places.

Technical Requirements*

- C2 Message Translation:
  - Focus on information flow for events and unit status.
- Data Transactions:
  - Handle real-to-sim, sim-to-real, real-to-real. Monitor sim-to-sim.
- RTI Requirements:
  - Must be able to relate information sources and processors.
- Communications Timing:
  - Support for GPS-based C4I systems.
- System Specific Requirements:
  - Focus on a realistic C4I information flow and message formats.
- Support long-term embedding of Sims into C4I systems:
  - Interoperability with Ada-based DII/COE and Simulations.

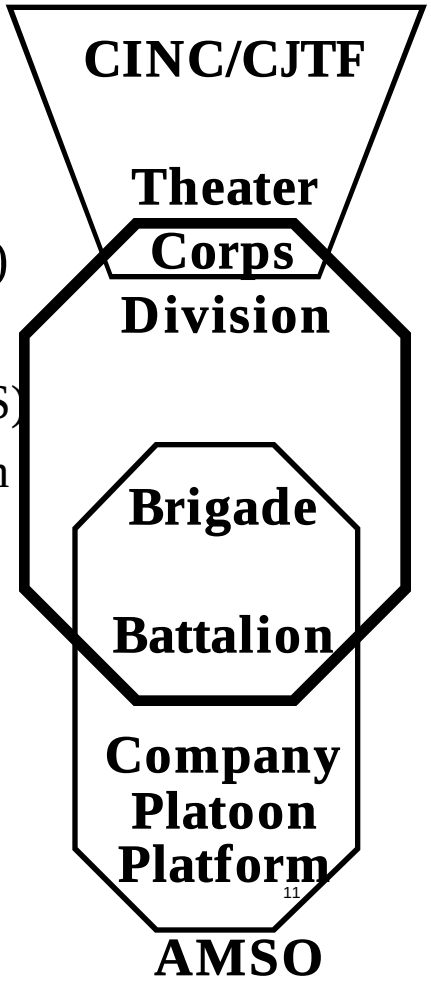
* *Expanded in the back up slides.*

MRCI Proposal

- C4I systems
- Simulations
- Synchronization

Army Battle Command System (ABCS)

- Joint Program: Global Command and Control System (GCCS)
- Army Global Command and Control System (AGCCS)
- Army Tactical Command and Control System (ATCCS)
  - Maneuver Control System/Phoenix (MCS/P)
  - Advanced Field Artillery Tactical Data System (AFATDS)
  - Forward Area Air Defense Command and Control System (FAADC2)
  - All Source Analysis System (ASAS)
  - Combat Service Support Control System (CSSCS)
- Force Battle Command Brigade and Below (FBCB2)
  - Appliqué
  - Embedded Systems



C4I System Nominations

- Next generation releases of C4I system software.
  - MCS/P Baseline (Build V, Block III)
  - AFATDS (Ver 1.0.06)
- Early beta releases but are the ones headed for DII compliance and fielding.
- Will depend upon current Army SSM programs to continue building other ABCS system interfaces since the C4I systems are interdependent.
- Focus on getting the tactical message flow correct:
  - Who sends what, to whom, when, by what communications, in what format, and what triggered it?

Simulation Nominations

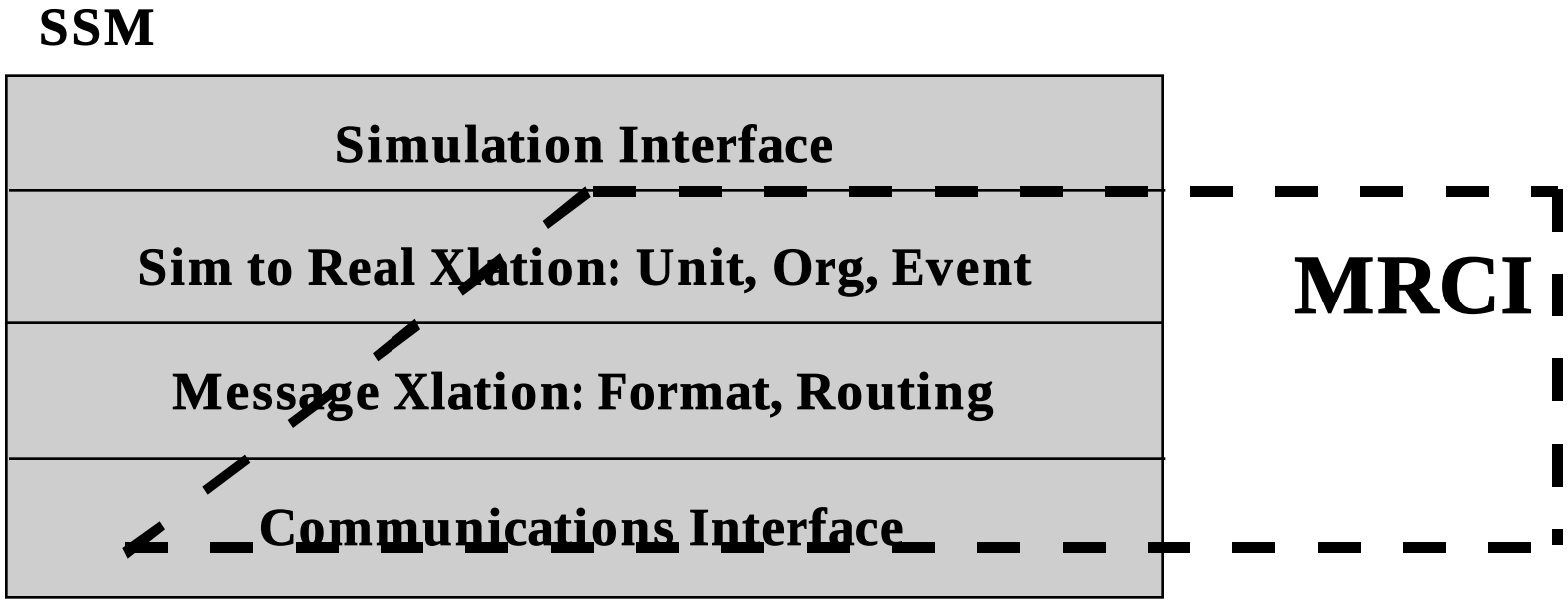
- Current and future simulations used for training and/or analysis.
  - Corps Battle Simulation (CBS) (Ver 1.5.3) - Training.
  - OpenSAF/MODSAF/CATTSAF - Training and Analysis.
- Provide existing capability to interact across a broad spectrum of land warfare operations.
- Provide both aggregate and entity-level interactions.

Available Information (GFI)

- Simulation Support Modules (SSMs or ‘interfaces’) for:
  - MCS/P Baseline, AFATDS, FAADC2, et al.
- COE: Full support from PM OPTADS, PEO C3, earliest prototype versions of COE-compliant software (summer 96 - summer 97).
- Documentation on CBS, ABCS System and SSMs.
  - SSMs have some documentation but will require coordination.
- Invitation to observe/participate in test/training exercises during the next 120 days (PW96)...informs PDR/CDR.

Simulation Support Modules

- Developed by TEXCOM/EPG to stimulate C4I systems.
- Similar functions to MRCI but currently tightly coupled systems.



Scheduling Goals

- Synch with DII COE releases.
- Synch with ATCCS Block VI.
- JTC Events
- STOW 97

- Synch Army C4I/SSM enhancements with experiments.
- Look at near-term events for education.
  - ATCCS integration tests
  - PW 96,
  - JWID 96

MRCI, ALSP, & JTC Concerns

- Do not want to break anything that currently works to support exercises: JTC and ALSP Infrastructure Software.
- ALSP has limited support for data flow required to stimulate Army MCS/P and AFATDS systems.
- Current Exercise Support structure requires:
  - Portability to VAX infrastructure (Personnel, Hardware, Licenses)
  - Training and Operations
- IAW JROC guidance no funding for making major changes to CBS to grow to new set of AIS/HLA requirements.
- Need to continue discussion.

Potential for FAADC2

- Forward Area Air Defense C2 System (FAADC2).
- Important Army Corps CJTF and Div System for Theater Missile Defense.
  - Engagement Operations
  - Cdr's Real Time Tactical Display - An extremely time-sensitive graphical display.
- Have Current SSMs with CBS. Relatively easy to integrate into program.
- PM is ready to support technical exchange as desired.

Summary

- Army is excited about participating in MRCI. Strong interest in Training, Analysis, and RDA.
- The full team is ready to support.
- Offering significant experience in C4I stimulation development.
- Looking forward to an open and cooperative relationship.

Backups

TEMO

- Training / Exercises
  - Battle Command Training Program: 4 Corps, 10 Divisions, Joint Exercises
  - Broad spectrum of events.
    - ≈ Single Unit - few nets, often unclassified.
    - ≈ Ulchi Focus Lens - Many nets and msgs. Usually classified.
  - Transparent to training audience: Comprehensive coverage, real time, dynamic environment
  - Currently use Army (EPG) developed C4I/CBS interfaces
- Mil Opns have short timelines for preparation
  - Real world data
  - Updated frequently

Warfighting Experiments

- Advanced Concepts and Requirements (ACR) Domain has requirements for C4I/Sim interfaces
- Unique configurations of C4I systems prototypes and units examining DTLOMS to support the future (Force XXI)
- Data synchronization from closed form simulation run to Live-Sim experiment
- Classified
- High-resolution
- “Live” C4I systems enhance analysis...HITL provides more representative conditions (human-in-the-loop)

Testing of Systems

- VV&A
  - Multiple C4I systems at once.
  - Comprehensive exploration of messages checking all data elements.
- Extensive data collection:
  - Live to Sim and Sim to Live.
  - Live to Live.
- Need to portray larger battlefield than live testing environment.
- Bottom Line: Use simulations to create test conditions that replicate TEMO applications.

C4I Program Background

- Army policy that all software-based systems conform to the Army Technical Architecture, a subset of the DII.
- C4I systems migrating to become DII COE compliant.
- “Pre-alpha” versions due out Summer 96.
- Full COE compliance by 1998.
- Army C4I expanding to include STAMIS.
- 31 May decision on MCS/P Baseline “Block IV”

C2 Message Translation

- Uses generic C2 simulation interface language (CCSIL-like) to interact with C2 information within simulation.
- Common Modules translates “CCSIL” encapsulated messages based on receiving data link specifics.
- Translates C4I output to “CCSIL” messages.
  - Data, voice, imagery (Secondary and UAV)
- Translates “CCSIL” messages to C4I input form:
  - VMF (AFATDS), USMTF (MCS/P), System Specific (TACFIRE).
  - Considers effects of distributed GPS-based systems on location and timing.
- Adjudicates delivery of “CCSIL” and C4I messages and maintains knowledge of transactions.

Data Transactions

- All information passed around the C4I system is identified by MRCI.
  - Required by HLA.
  - Need to cover Real to Sim, Sim to Real, and Sim to Sim.
  - Need to notify the Federates about real to real data (for EW).
- Real to Real information is logged, affected, and routed outside the RTI by the MRCI.
  - Applies communication/network affects to incoming messages.
- Provides ability to tie C4I information with an “owning/holding” entity and affect access of that information as a function of the attribute values of the entity (a damaged CP loses info).
- Facilitates data collection of FOM and non-FOM data.
- Provides ability to rapidly exchange and synchronize C4I and Sim databases.

RTI-Based Requirements

- Interoperates with federations via all five RTI service categories.
- Provides federation simulated C4I systems with address/ subscription identification recognized by live systems.
- Provides live systems a service for registering with to federation.
- Recognizes which C4I devices (live versus sim) need to receive a particular message.

Communications Timing

- Forwards messages among systems in a timely manner.
  - Consider effects of latency on distributed GPS-based systems.
  - Different C4I systems have different timing schemes.
  - Need to avoid delays that impact operations.
- Accommodates C4I systems that can not handle future data.
- Supports graceful degradation of connectivity.
- Provides mechanism for re-synch with C4I systems following degraded operations.

System Specific Requirements

- Performs system-specific hardware acknowledgment at MRCI.
- Focus on message formats:
  - Generic.
  - System Specific.

Sample Data Formats

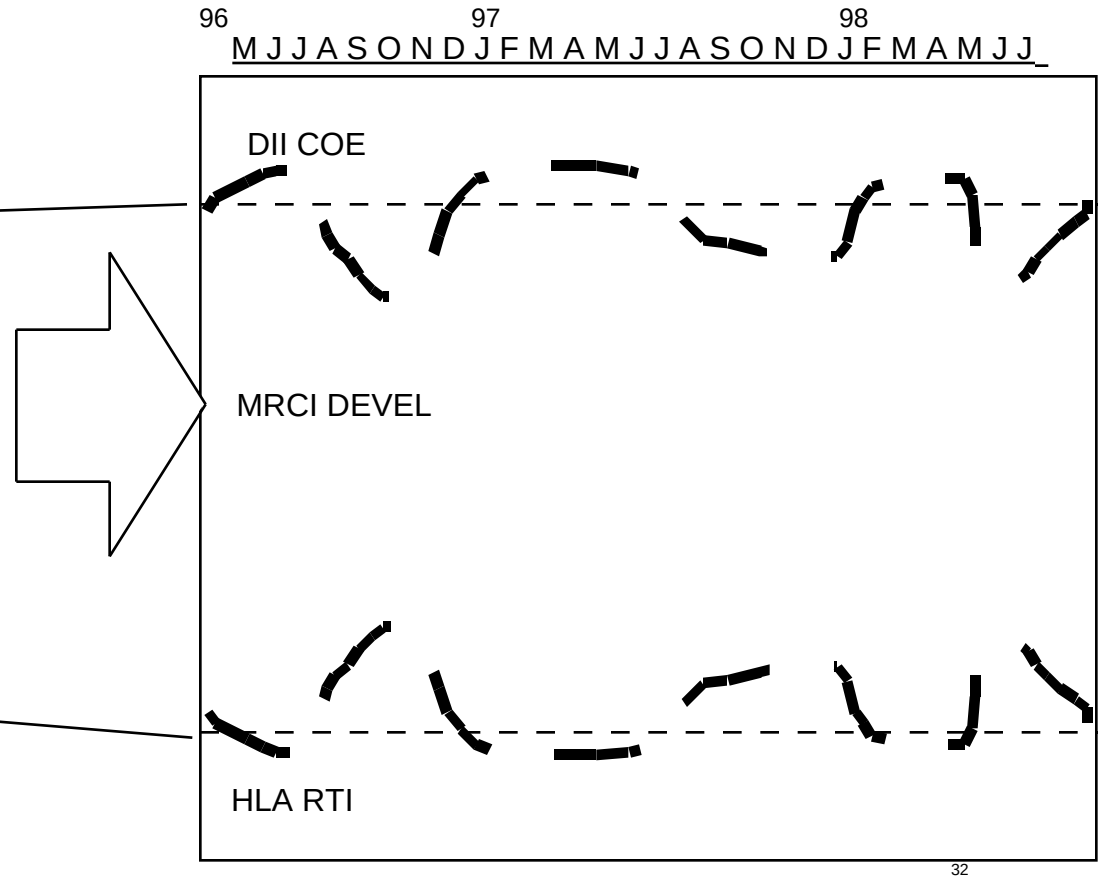
- Generic: USMTF, VMF, Joint Tactical Data Link, CCSIL, et al.
- DII COE
  - TACFIRE, AFATDS, MCS/P, ASAS, ISYSCON ...
- RISTA Systems
  - Video from UAVs.
  - 2D, 3D imagery.
- Joint Communications Planning and Management System
- COMSEC
- ....

Embedding Requirements

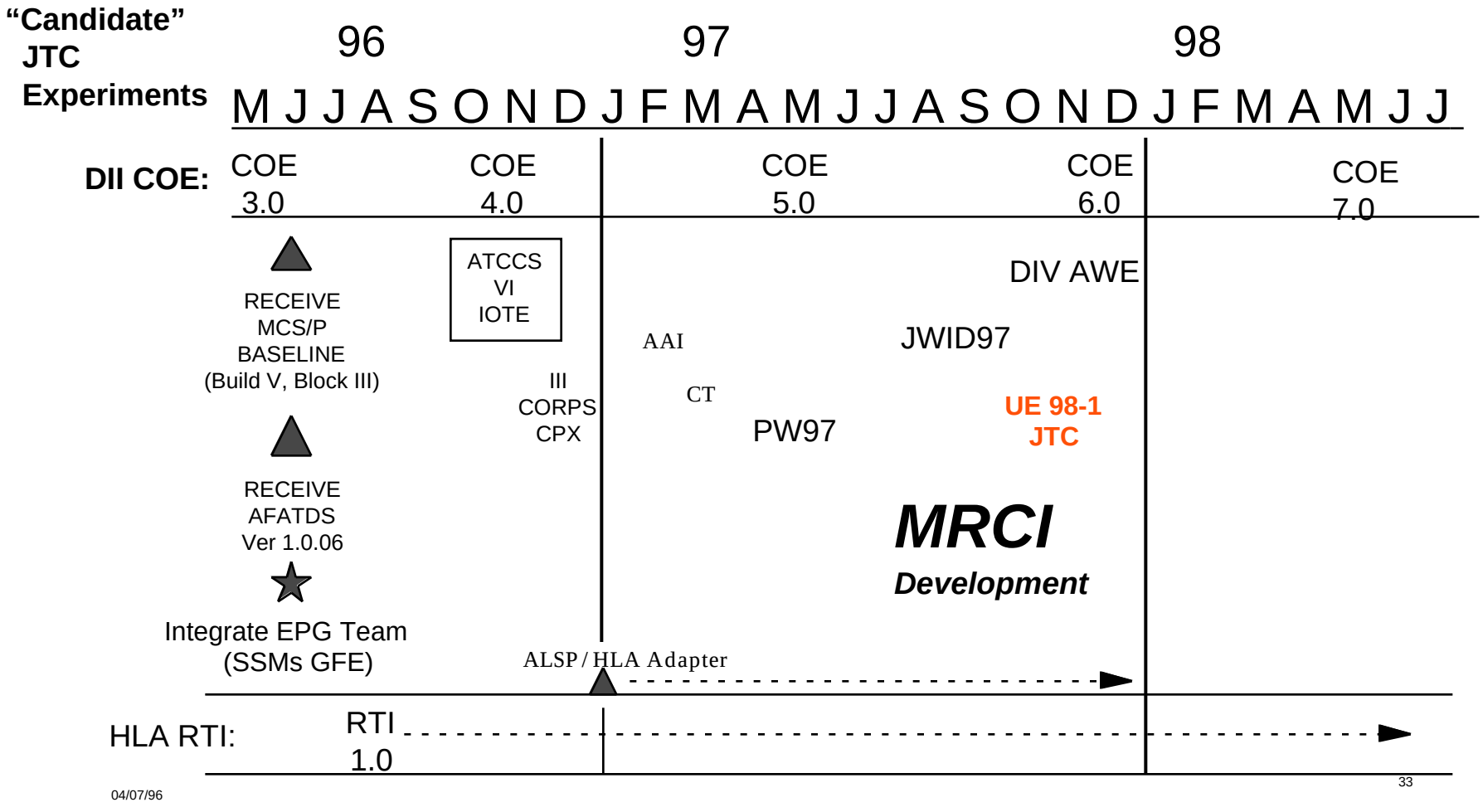
- DII/COE compliant.
- Fully interoperable with Ada 95 software as required.
- Operates over real world communications systems.
- Interfaces with communications protocols:
  - MSE
  - EPLRS NCS (X.25)
  - ATCCS LAN (IEEE 802.3)
  - Tactical 2 and 4 wire comms.

Synchronizing Schedules

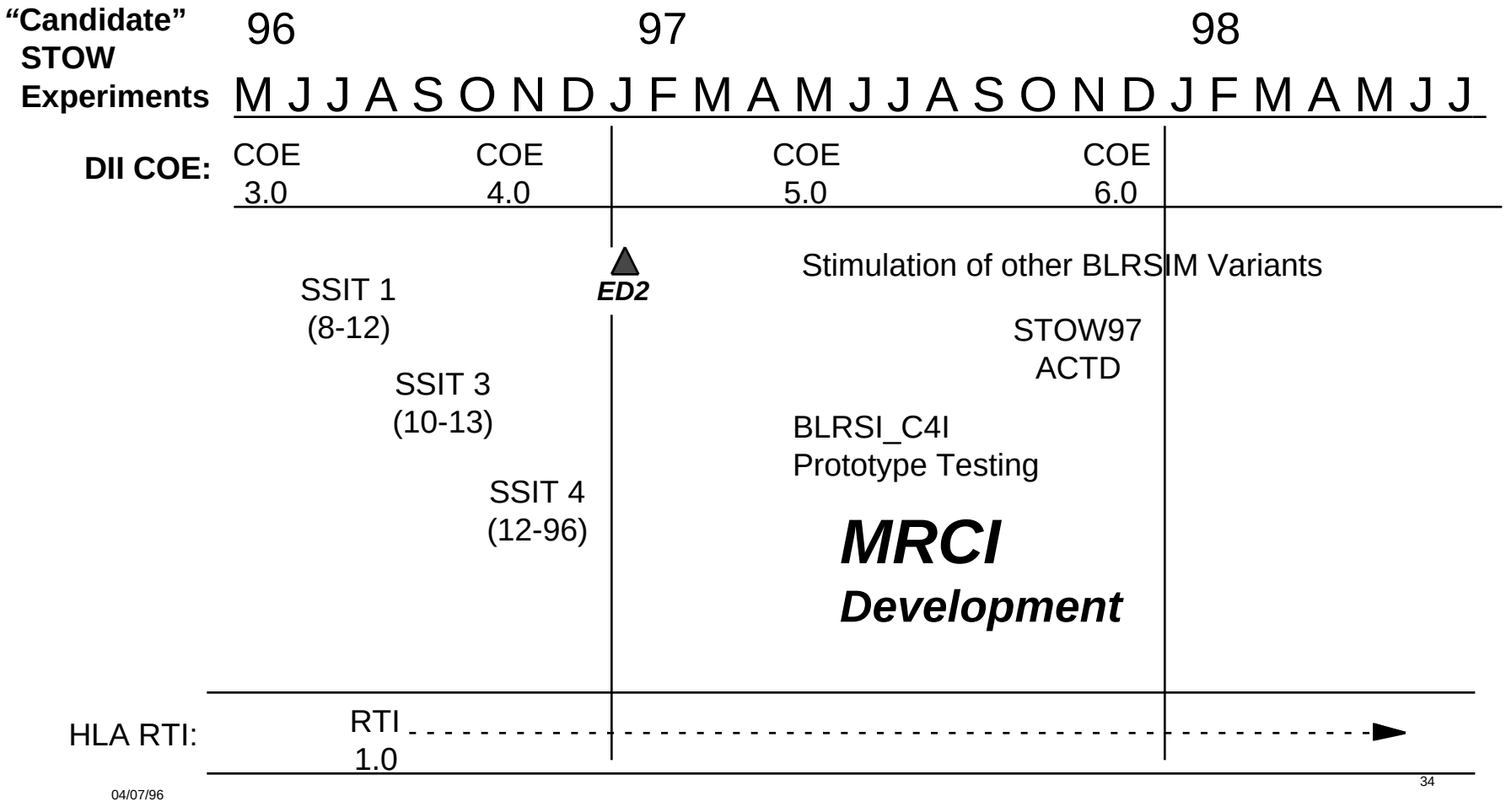
- DII COE
- CBS/JTC
- ABCS
- BLRSI
- STOW 97
- HLA RTI



Schedule: Experiment A JTC



Schedule: Experiment B SAF-Based



Potential MRCI Events

- Near-term ATCCS integration tests (ATCCS VI, IOTE)
- JTC: AAI 97, CT, PW97, DIV AWE
- JWID 97
- STOW 97
- Battle Lab Experiments

Retain 'agility' by NOT aligning MRCI to a specific (graduation) exercise ... yet.